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Novel Aspects of Correlated Electron Motion in (K/Na)xCoO2 systems Revealed by Advanced Photoelectron Spectroscopy[1] M. ZAHID HASAN, Dept. of Physics, Princeton University, D. QIAN, M. FOO, Princeton University, ROBERT CAVA, Dept. of Chemistry, Princeton University — Recent discovery of superconductivity, large thermopower and other unusual transport behavior in cobalt oxides ($Na_{0.3}CoO_2.nH_2O$) have generated much interests in understanding the many-body character of the electron liquid in this system. We employ advanced photoelectron spectroscopic techniques to reveal the microscopic electron dynamics in Na_xCoO_2 and K_xCoO_2 system classes. Results directly unveil an unusual and novel nature of many-body electron motion manifested through strong bandwidth suppression, heavy-fermion-like carrier mass and unusually slow movement of low-lying electrons despite the presence of a large Fermi surface indicating a two orders of magnitude departure from the conventional BCS paradigm. Temperature dependence of quasiparticles in the over-doped cobaltates shows that spectral weight remains well defined in the T-linear resistivity regime. Unusually small single-particle hopping and unconventional quasiparticle dynamics have direct implications for understanding the novel phase of matter realized in this new class of strongly interacting complex system.

[1]Work in collaboration with A. Kuprin, Y.D. Chuang, A. Fedorov, E. Rotenberg and Z. Hussain

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